# Table of Contents

## E70 Panorama Glass Sunroof




Initial Print Date: 10/06 Revision Date:

# Panorama Glass Sunroof

## Model: E70

## Production: From Start of Production

# OBJECTIVES

After completion of this module you will be able to:

- Understand and be able to explain the panorama sunroof in the E70
- Initialize the panorama sunroof

# Introduction

The panorama glass sunroof can be ordered as a stand alone option (402) or comes with the premium package option on the E70. A number of control units participate in the operation of the panorama glass sunroof.

The roof function center controls and monitors the motor of the panorama glass sunroof.

The roof function center (FZD) is, for example, linked with the Car Access System CAS 3, which enables or disables operation of the panorama glass sunroof.

The footwell module FRM supplies the signal from the door contacts. The junction box control unit provides the power supply for the motors via the terminal 30g relay.

The Dynamic Stability Control provides the road speed signal.

## Operating Concept

The panorama glass sunroof operating button has three directions of movement. In addition to the manual and overpress functions, the button has a double-click function into the three movement directions.

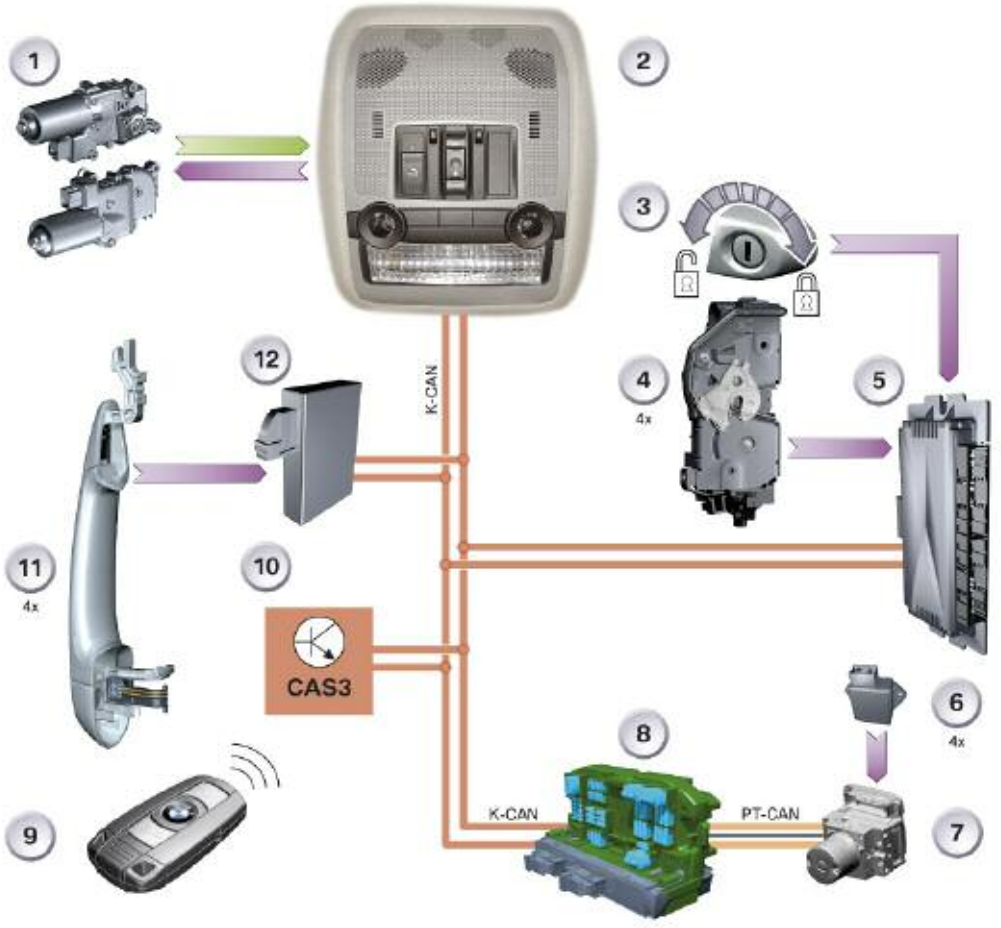
In the double-click function the button is actuated twice within a short time into the overpress position or tilt position.

This allows the customer to have the panorama glass sunroof opened and closed automatically from any position of the sunroof and its blind.

When the panorama glass sunroof is in motion, its movement can be stopped by operating the button again.

# System Overview

## Inputs/Outputs

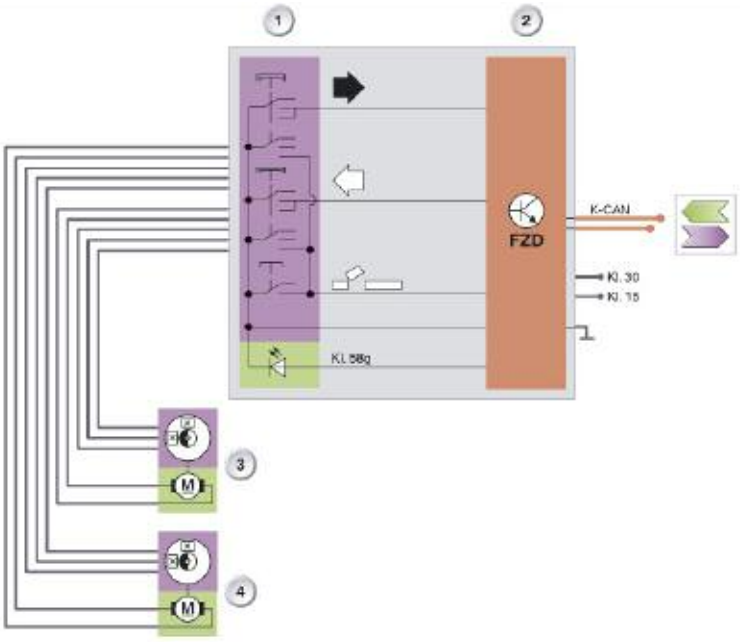



| Index | Explanation | Index | Explanation |
|---|---|---|---|
| 1 | Panorama glass sunroof motors | 8 | Junction Box control unit JB |
| 2 | Roof function center | 9 | Identification transmitter |
| 3 | Driver's door lock cylinder | 10 | Car Access System 3 CAS 3 |
| 4 | Door contacts (4x) in the vehicle doors | 11 | Driver's side and passenger side outside door handles |
| 5 | Footwell module FRM | 12 | Comfort Access |
| 6 | DSC sensor | K-CAN | Body CAN |
| 7 | Dynamic stability control | PT-CAN | Powertrain CAN |

The button in the roof function center (2) is used to open, close and tilt the panorama glass sunroof.

The roof function center controls and monitors the operation of the motors (1) for the panorama glass sunroof.

## System Circuit Diagram




| Index | Explanation |
|---|---|
| 1 | Button for panorama glass sunroof |
| 2 | Roof function center FZD |
| 3 | Motor, panorama glass sunroof |
| 4 | Motor, panorama glass sunroof |
| K-CAN | Body CAN |
| Kl. 15 | Terminal 15 |
| Kl. 30 | Terminal 30 |
| Kl. 58g | Terminal 58 switched |

| K-CAN signals at the roof function center | | | |
|---|---|---|---|
| In/out | Information | Source/sink | Function |
| In | Vehicle speed | Rotational speed sensor > Dynamic Stability Control | Release the wind deflector |
| In | Outside temperature | Outside temperature sensor > instrument cluster | Value used in determining the thermal protection for the panorama glass sunroof motors |
| In | Panorama glass sunroof release | Car Access System 3 > roof function center | Release signal for operation of the panorama glass sunroof |
| In | Terminal 50 status | Car Access System 3 > roof function center | Interruption of the adjustment procedure for the panorama glass sunroof |
| In | Comfort opening | Identification sensor/remote control > Car Access System 3 | Comfort opening of the panorama glass sunroof |
| In | Comfort opening | Driver's door lock cylinder > footwell module | Comfort opening of the panorama glass sunroof |
| In | Comfort closing | Identification sensor/remote control > Car Access System 3 | Comfort closing of the panorama glass sunroof |
| In | Comfort closing | Driver's door lock cylinder > footwell module | Comfort closing of the panorama glass sunroof |
| In | Comfort closing | Outside door handle > Comfort Access | Comfort closing of the panorama glass sunroof |
| Out | Anti-trapping protection deactivated | Roof function center > instrument cluster | Anti-trapping protection function indicator deactivated |

Comfort opening and comfort closing can be operated from the identification transmitter/remote control or via the lock cylinder in the driver's door. This is done by holding down the locking/unlocking button until the panorama glass sunroof is closed/opened.

The lock cylinder operates in a similar fashion. The mechanical key must be held in the locking/unlocking position until the panorama glass sunroof is closed/opened.

The panorama glass sunroof can be closed by touching the sensitive area on the outside door handle. The sensitive area must be touched until the panorama glass sunroof is closed.

# System Components

The panorama glass sunroof in the E70 comprises mechanical and electrical components.

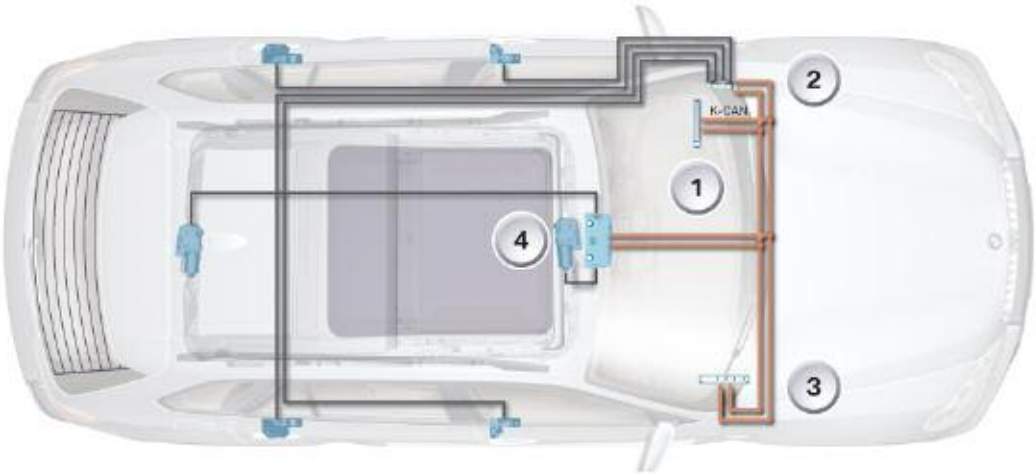
## Mechanical Components

- Glass roofs
- Blind
- Panorama glass sunroof cassette
- Wind deflector

## Electrical Components

- Button
- Control units
  - Car Access System 3
  - Footwell module
  - Roof function center
- Panorama glass sunroof motors.

The following graphic shows all the electrical components of the panorama glass sunroof system together with the appropriate control units and control elements.




| Index | Explanation | Index | Explanation |
|---|---|---|---|
| 1 | Car Access System 3 | 3 | Junction box control unit |
| 2 | Footwell module | 4 | Roof function center |

## Control Units

### Car Access System 3

The Car Access System 3 issues the release signal for the panorama glass sunroof.

Movement is prevented during the engine starting phase by sending the "Terminal 50 ON" status. This means that there is more energy available from the battery for the starter to start the engine.

### Footwell Module

The footwell module makes available the status of the door contacts and the driver's door lock cylinder.

The footwell module also supplies the roof function center with information concerning the "Terminal 58g ON" status.

### Roof Function Center

The roof function center contains the complete functions of the panorama glass sunroof. The roof function center is always

installed in connection with the panorama glass sunroof.

The relays required to drive the panorama glass sunroof motors are integrated in the roof function center.

### Panorama Glass Sunroof Motor

One motor for the panorama glass sunroof has two Hall sensors.

The Hall sensors are located on the motor shaft and are offset against one another by 90°.

When the motor is running, this results in two temporally offset Hall signals that are used to register the direction of rotation of the motor and for the anti-trapping protection function.

The motor is new, but functionally identical to its predecessors. The visible difference is that its casing is made of plastic.

Note  Two motors are fitted to move the panorama glass sunroof.

# Principles of Operation

The roof function center receives signals from the other control units for the functions of the panorama glass sunroof.

The executing control unit is the roof function center. It controls the panorama glass sunroof motor on demand and at the same time monitors the motor's rotation.

The following functions of the panorama glass sunroof are built in the roof function center:

- Reading operation requests
- Controlling the panorama glass sunroof motors
- Opening/closing the panorama glass sunroof and blind
- Anti-trapping protection function
- Blocking protection
- Panic mode
- Load cut-out during start procedure
- Terminal 58g
- Initialization

## Reading Operation Requests

Panorama glass sunroof operation may be requested through the following controls:

- Panorama glass sunroof button
- Remote control/identification transmitter
- Driver's door lock cylinder
- Outside door handle in Comfort Access

### Panorama Glass Sunroof Button

The button for the panorama glass sunroof is located in the roof function center.

When operated, the button sends a low signal to the electronic module that drives the panorama glass sunroof motor corresponding to the button selection.

The LED (locating lamp) of the button in the roof function center is supplied from the "Terminal 58g ON" terminal status.

### Remote Control/Identification Transmitter

The convenient opening/closing function is initiated by pressing the button on the remote control/identification transmitter.

### Driver's Door Lock Cylinder

The convenient opening/closing function is triggered by turning and holding the mechanical key or the spare key in the open/close position in the driver's door lock barrel.

### Outside Door Handle

Comfort closing can only be triggered using the outside door handle with Comfort Access.

The sensitive area must be touched for a long time to launch the comfort closing process.

Only then will the roof function center execute the comfort closing. Releasing the sensitive area interrupts the comfort closing.

## Motor Control

When the roof function center receives a request for the panorama glass sunroof, it controls the integrated relay. The panorama glass sunroof motor is supplied with power through the relay.

The relay contacts are monitored by the roof function center to ensure that perfect control of the motor and the panorama glass sunroof is achieved. In addition, the motor speed is calculated and the direction of the motor's rotation is detected from the pulses of the Hall sensors.

The distance the panorama glass sunroof must cover during the opening or closing procedure is defined in the roof function center. The panorama glass sunroof motor generates a certain number of pulses within this distance and therefore recognizes the end positions of the panorama glass sunroof.

## Anti-Trapping

Both the glass roofs and the floating blinds are equipped with an indirect anti-trapping protection function. The indirect anti-trapping protection function operates on the basis of the power consumption of the panorama glass sunroof motor.

If the roof function center detects a trapping situation, the corresponding motor is stopped and controlled in the opposite direction. This opens the glass roof or blind again (approximately 20 cm) and releases the obstruction.

## Blocking Protection

If the pulses from the Hall sensors drop out for more than 500 ms during an opening or closing operation, the roof function center detects a blockage.

The power supply to the motor is switched off.

### Thermal Protection

The thermal protection for the panorama glass sunroof motor is calculated in the roof function center. To this end, a temperature sensor is mounted on the board in the roof function center to measure the ambient temperature.

The roof function center calculates the current temperature of the motor by applying the running time of the panorama glass sunroof motor.

The warm-up and cool-down periods are stored in a temperature model in the roof function center.

The current temperature is stored in the memory before the roof function center passes into sleep mode. The motor temperature is made equal to the ambient temperature when the vehicle is started again.

## Panic Mode

The panorama glass sunroof is closed with maximum closing force in panic mode. Panic mode is triggered by pressing and holding, reversing, releasing and pressing and holding the panorama glass sunroof button again.

A valid release signal from Car Access System 3 is the precondition for the execution of the emergency closing function.

It is necessary to release and press the button again, as the first time the button is pressed the anti-trapping protection function is still active. The panorama glass sunroof closes with maximum force as a result of the second press within a short time.

It is possible to activate panic mode up to a vehicle speed of 16 km/h. Panic mode can be activated from both the tilt position (approximately 100 ms) and from the open position (approximately 1 s).

## Load Deactivation

Operation of the panorama glass sunroof is aborted/interrupted during the vehicle start procedure. Operation of the panorama glass sunroof can resume on completion of the starting procedure.

The Car Access System 3 retracts the release signal to operate the panorama glass sunroof during the vehicle starting procedure. The Car Access System 3 issues the release signal again on completion of the starting procedure.

## Terminal 58g

When the exterior lights are switched on, the footwell module sends this information via the K-CAN.

The roof function center receives this information and adopts the set value for the instrument lighting.

The LED in the button for the panorama glass sunroof is controlled by a pulse-width modulated signal from the roof function center. This achieves a constant brightness of the LED even under fluctuating system voltage conditions.

## Opening/Closing the Panorama Glass Sunroof

The button can be moved to two engaged positions in the opening and closing directions. In the first engaged position, a movement is initiated which is only executed for as long as the button is being pressed.

Control functions

- Opening blind only
- Opening blind and glass roof (to comfort position)
- Glass roof tilt position and blind ventilation position
- Closing glass roof only
- Closing glass roof and blind
- Closing blind only with glass roofs already closed.

All control functions are also available as one touch control functions (comfort functions).

The one-touch control function is reached by pressing the button again to the second engaged position in the direction required for the panorama glass sunroof.

The one-touch control function provides automatic opening or closing of the panorama glass sunroofs.

### Directions of Movement

Initial state:

Both glass roofs and both blinds closed.

### Opening Blinds

Press "OPEN" 1 x

- Signal from switch to roof function center
- The roof function center controls the rear motor as long as the button is pressed or until the blind is fully opened.
- Rear motor opens both blinds
- The glass roofs remain closed

### Opening Blinds (one-touch control function)
Press "OPEN" 1 x

- Signal from switch to roof function center
- Roof function center activates rear motor
- Rear motor opens both blinds
- The glass roofs remain closed

### Opening Blinds and Glass Roof
Press "OPEN" 2 x (double-click function)

- Signal from switch to roof function center
- Roof function center first activates the rear motor
- Rear motor opens both blinds
- The roof function center controls the front motor after a time, from a short distance from the blind.
- Front motor opens front glass roof
- Rear motor raises wind deflector

### Tilt Position
Press "TILT" 1 x

- Signal from switch to control unit
- Roof function center activates both motors
- Front motor tilts both glass roofs
- Rear motor moves both blinds forwards into the gap position (ventilation position).

### Closing Glass Roofs
Press "CLOSE" 1 x

- Signal from switch to roof function center
- The roof function center controls the front motor as long as the button is pressed or until the glass roofs are fully closed.
- Front motor closes both glass roofs

### Closing the Glass Roofs (one-touch control function)
Press "CLOSE" 1 x past the first stop

- Signal from switch to roof function center
- Roof function center activates front motor
- Front motor closes both glass roofs

## Closing Glass Roofs and Blind

Press "CLOSE" 2 x (double-click function)

- Signal from switch to roof function center
- Roof function center first activates the front motor
- Front motor closes both glass roofs
- The roof function center controls the rear motor after a time, from a short distance from the glass roof.
- Rear motor closes both blinds and releases the wind deflector so that the glass roof can press it down.

## Closing the Blinds

(only possible if glass roofs are already closed)

Press "CLOSE" 1 x

- Signal from switch to roof function center
- Roof function center activates rear motor
- Rear motor closes both blinds

### Wind Deflector with Roof Open

The roof function center receives a speed signal from the Dynamic Stability Control.

The roof function center controls the rear motor to release the wind deflector from a road speed of 180 km/h. Consequently, the wind deflector is depressed into a lower position.

Note: The motor only runs lightly, the blinds do not move.

## Comfort Opening

The panorama glass sunroof can be opened by extended actuation of the unlock button with the remote control/identification sensor or with the mechanical key in the open direction.

Note: The movement of the window risers must be completed before comfort opening of the panorama glass sunroof can start.

## Comfort Closing

The panorama glass sunroof can be closed by extended actuation of the lock button with the remote control/identification sensor or with the mechanical key in the close direction.

If the vehicle is equipped with Comfort Access, comfort closing can be started by touching the sensitive outside surface.

# Service Information

## Initialization

Initialization of the panorama glass sunroof involves the following procedures that are necessary to ensure complete operation of the panorama glass sunroof:

- Normalization
  Normalization means locating the mechanical end position at the stop for the tilt position. This position is stored and is used in calculating the remaining end positions for the panorama glass sunroof.
- Learning the characteristic curve
  The learning procedure registers the closing force necessary for each direction of the panorama glass sunroof and stores this value.

Complete functionality of the panorama glass sunroof can be guaranteed only by full initialization.

The initialization procedure can be initiated with the button for the panorama glass sunroof or via the diagnosis system.

### Initialization with the Button

Initialization is performed as follows:

- Press and hold control button in sunroof tilt direction Move both glass roofs into the tilt position and both blinds into the ventilation position
- After approximately 15 seconds the initialization run starts in the tilt direction and stores the end position
- The panorama glass sunroof is closed after 5 seconds in the tilt position
- The panorama glass sunroof is then opened and the end position stored.

Note: The control button must remain pressed during the entire initialization procedure. The initialization procedure must be repeated if the button is released.

Initialization takes approximately 120 seconds.

## Interruption in Power Supply

An interruption in the power supply does not require a new normalization. The initialization is invalidated if the power supply is interrupted during the initialization or during operation. A new initialization will then be necessary.

### Clearing the Initialization

Initialization is cleared under the following circumstances:

- Failure of the power supply during initialization
- Hall sensor fault detected
- Position implausible
- Certain calls in the diagnostics
- Changed vehicle coding
- Coding data faulty